
GLASSY-WINGED SHARPSHOOTER

SURVEY GUIDELINES

Statewide Survey

Initial County Survey

Nursery Survey for Infested Counties

California Department of Food and Agriculture

Plant Health and Pest Prevention Services

March 2000

INTRODUCTION AND TABLE OF CONTENTS

The Glassy-Winged Sharpshooter (GWSS) Survey Guidelines provide basic information regarding survey areas, methods, hosts, specimen collection and identification for surveying of nurseries, urban areas, and crop production areas. The Department greatly appreciates the contributions of R. A. Redak, J. A. Bethke, T. D. Paine, J. N. Kabashima, and M. Blua, University of California, Riverside, in preparing the guidelines for the AMonitoring for GWSS in Commercial Nurseries.@

SECTIONS

- I. GWSS Statewide Survey Recommendations and Guidelines
- II. Initial County GWSS Survey
- III. Nursery Survey for GWSS Infested Counties

APPENDICES

- A. Glassy-Winged Sharpshooter Oviposition and Food Hosts
- B. Monitoring for GWSS in Commercial Nurseries
- C. Map

California Department of Food and Agriculture
Plant Health and Pest Prevention Services
March 2000

GLASSY-WINGED SHARPSHOOTER STATEWIDE SURVEY RECOMMENDATIONS AND GUIDELINES¹

The glassy-winged sharpshooter (GWSS), *Homalodisca coagulata*, first reported in California in the early 1990's, is currently known to be widely distributed in the south coastal region of the State. Infested south coastal counties include Santa Barbara, Ventura, Los Angeles, Orange, San Diego, and adjacent inland areas of western San Bernardino and Riverside Counties. In the summer of 1998, GWSS was detected in commercial citrus and grape plantings located southeast of Bakersfield in Kern County. During the early 1990's, high GWSS populations were associated primarily with citrus along the coast. Recently, this sharpshooter has become locally abundant further inland (Riverside and San Diego Counties) where it has been implicated as the primary vector in a Pierce's Disease epidemic in the Temecula Valley.

Potential Range in California

There is currently no methodology available to predict the potential range of GWSS in California. Methodology development has been identified as a research priority by the California Department of Food and Agriculture (CDFA) Glassy-Winged Sharpshooter/Pierce's Disease Task Force. Although the distribution of citrus may be predictive of the sharpshooter's range in the San Joaquin Valley and Southern California, there is the possibility that other widely distributed native plants (such as oaks) may play a significant role in reservoiring GWSS populations along the central and northern coasts and in the Sacramento Valley. Given this possibility, the potential range of this insect may encompass most of the major agricultural production regions of the State. As such, GWSS may represent a significant statewide threat to grape, peach and almond growers because of its ability to effectively vector various strains of the bacterium *Xylella fastidiosa*.

Survey Area

The crops listed above are grown commercially in many California counties in which GWSS has not been detected (Appendix C). Limited infestations occur in two commercial production counties, Kern and Santa Barbara. Some highly urbanized counties are adjacent to commercial production areas and might serve as introduction sites for GWSS, such as Marin and San Francisco. The following 43 counties are recommended for survey:

Alameda, Amador, Butte, Calaveras, Colusa, Contra Costa, El Dorado, Fresno, Glenn, Humboldt, Imperial, Kern, Kings, Lake, Madera, Marin, Mariposa, Mendocino, Merced, Monterey, Napa, Nevada, Placer, Sacramento, San Benito, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tulare, Tuolumne, Yolo, and Yuba (Appendix C).

¹ Recent changes are indicated with double underlining.

Available Survey Methods

Visual Searches - Visual searches can be conducted to find adults, nymphs, nymphal cast skins, egg masses, and egg scars. When searching for active life stages on individual plants, certain behavioral characteristics of the sharpshooter can be used to increase the probability of detection. Important traits to be considered are: 1) adults and older nymphs are primarily stem feeders; 2) new flush growth is preferred; and 3) on trees, the insects usually select shoots that are growing upward (vertically oriented as opposed to horizontal twigs). GWSS selects southern exposures.

Host searches should be enhanced by using nets (aerial and sweep) and beating sheets. The effectiveness of these collection devices is largely dependent on the types and density of life stages present. When populations are large and well established, adults are often the easiest life stage to detect because they are highly visible when flying around or between their host plants. Flight activity is most pronounced during the late morning and afternoon hours, therefore, surveys should be conducted during the warmer parts of the day, if practical. Correct timing is particularly critical if adult numbers are low. At low densities and during cooler times of the day, nets may be used to agitate foliage causing cryptic adults to take flight. Either aerial or sweep nets can be used to capture adults, but the former are often more effective since they are lighter, more maneuverable, have larger openings, and are often equipped with longer handles. Retrieval of specimens from aerial nets is also more efficient as captured individuals are always visible. Sweep nets are constructed of sturdy durable materials and designed to quickly sample a wide variety of short (generally four feet or less in height), woody, and herbaceous plants, such as those found in nurseries. However, care must be exercised when using these nets so that certain tender plants are not injured. Beating sheets are also an excellent tool because they: 1) are more effective (as compared to a sweep net) in direct sampling of highly suspect plant parts, such as erect flush growth; and 2) permit the rapid discovery of nymphs and their cast skins. They also help facilitate the capture of nymphs because unlike adults, which often fly before or immediately after landing, the immatures often will remain on the sheet long enough to allow collection. Beating sheets are most effective early in the day when temperatures are low and the insects are less active.

Traps - Yellow sticky panels measuring a minimum of 5" X 9" are the trap of choice for GWSS. Of the commercially available ones, unbaited Pherocon AM traps are the best suited for survey, as they are relatively inexpensive, have a moderately large sticky surface, and can be easily deployed in a wide variety of hosts, either by hand or with the use of a trapping pole. GWSS has also occasionally been recovered from the sticky inserts in Jackson traps, indicating that other trap types containing sticky components may yield specimens.

Hosts

The GWSS feeds on and oviposits in a wide variety of plants. The hosts listed in Appendix A are a compilation of plant species with which GWSS has been associated in

California and the southeastern United States. Undoubtedly, this list will continue to expand.

Citrus is a favored host in Southern California but very high sharpshooter populations have also been observed on avocado, crape myrtle, and several species of woody ornamentals. Other favored introduced plants include Eucalyptus and various members of the rose and mallow plant families. Native hosts include both evergreen and deciduous oaks, sycamore and laurel sumac.

Seasonality

GWSS has two generations per year. Studies in Southern California have shown that, although adults are present and must feed throughout the year, egg laying activities are either absent or reduced to very low levels during the winter months of December, January, and February. During this same period, the numbers of over-wintering adults also decreases. Egg laying resumes in late February and continues through May. The first generation completes development from late May to late August. Adults from this generation lay egg masses from mid-June through late September, which give rise to over-wintering adults. This developmental pattern results in overlapping generations in which each life stage reaches its highest levels at some time from June through October. Conducting surveys during this five-month period should optimize the probability of detection of established populations in urban/residential and cropland environments. In the case of mobile hosts (such as nursery stock), the timing of surveys may be dictated by the shipment schedules.

Sites at Risk Due to Natural Dispersal

There are two natural dispersal pathways by which the GWSS could expand its range northward into non-infested areas of the state. One is along the coast from Santa Barbara County. The other is through the San Joaquin Valley from the infested area in southern Kern County.

Recommendation: Systematic grid searches should be conducted in these two counties to accurately determine the limits of the current infestations. Although the sharpshooter has been known from Santa Barbara County for a number of years, it appears to be restricted to the urbanized coastal areas south of the Santa Ynez Mountains, between Goleta and Carpinteria. Transect surveys need to be conducted along the 101 corridor from Goleta north to Buellton, along Highway 1 to Lompoc, and along Highway 154 from Santa Barbara into the Santa Ynez Valley. Five sites per lineal mile should be surveyed along these routes utilizing both visual searches and yellow panel traps. Besides providing useful distributional information, these surveys may also provide some insights as to the suitability of native coastal plant species as hosts for GWSS. In addition to these transects, systematic visual grid surveys of dooryards and public use areas (parks, greenways, etc.) should be undertaken in the cities of Santa Ynez, Solvang, Lompoc, Vandenberg Village, Orcutt, and Santa Maria. In southern Kern County, transect surveys should be conducted from the Grapevine area north to Arvin, in citrus plantings along Highway 166 southeast of Maricopa, and in the citrus belt which extends along the western foothills of the Sierras from northern Kern County into Southern Fresno County. The western and northern boundaries of the Kern County infestation also

need to be more accurately delimited. This will require systematic grid searches of each of the one-mile sections lying entirely or partially within the incorporated areas of Bakersfield and Oildale.

Sites at Risk Due to Artificial Dispersal

Nurseries

Out-of-state nursery stock, infested with GWSS eggs, has been implicated as the possible source of the original California infestation. Egg masses have also been found on nursery stock grown in infested areas of the State. This indicates that nursery stock represents a viable pathway for introduction and intrastate movement of this insect pest.

Recommendation: Nurseries, which could potentially receive and disseminate GWSS infested plants into non-infested counties of California, should be identified and surveyed.

Nursery Surveys - The following protocols represent a compilation of a series of observations made during a recent survey of a limited number of wholesale nurseries in Southern California by California Department of Food and Agriculture entomologists and guidelines provided by University of California research scientists.

1. Adult surveys. Sweep nets should always be used to augment the visual examination of plant materials. It is advisable to survey all stock in the nurseries by this method, since adults may be widely scattered and resting on non-host plants. Sweeping is most likely to capture adults and/or nymphs when temperatures are below 60°F. As temperatures warm, adults are less likely to be caught by sweeping but this activity will cause adults to fly, making them easier to see. Adults can also be stirred up by agitating foliage with net handles or lightly jarring pots or containers. Adults are usually difficult to net in flight, so they should be followed to their landing site, knocked into either a sweep or aerial net, and then collected into alcohol.
2. Egg mass and nymphal surveys. These are best restricted to known ovipositional hosts within the nursery (Attachment A). Old egg scars are the easiest to detect since egg deposition sites are visible on both leaf surfaces. This is not always the case with newly laid eggs, as the raised surface blister (and characteristic waxy covering) is only visible on the undersides of the leaves. Consequently, a representative sample of leaves should be turned over and examined for egg masses. Backlighting against a sunny sky will also help in finding egg masses. Nymphs, and their cast skins, are best detected by using a beating sheet. Beating sheets permit the selective sampling of smaller, rapidly growing plants or regions of vigorous upright growth (such as the terminals and suckers) on large shrubs and trees.
3. Yellow sticky traps have also been found useful in nurseries and have occasionally detected the presence of sharpshooters when other survey techniques have failed. Based on limited observations in Southern California, traps can be

used to successfully monitor GWSS populations as long as they are strategically and properly placed (i.e., in areas containing a variety of known feeding hosts). Yellow sticky traps should be placed at about canopy height at a density of not less than one per one-half acre. If multiple canopies are present, then traps should be used to detect insects in each of the canopies present. Traps should be placed well within the nursery and never in the windrow or at the fence (property) line. Traps deployed in individual host plants should be positioned in a highly visible position (not hidden in the foliage), and placed in or near an area of vigorous upright growth on the warmest side of the tree. If plants are short, Japanese beetle rods, or wooden stakes or poles can be used to position traps at the proper height. Traps should be serviced every two weeks and remain in place for a minimum of ten (10) weeks.

4. Survey crews should have at least one person who can recognize a wide variety of plants and is familiar with the common and botanical names of ornamental plants. This is important because many nurseries do not label their stock or have maps showing where plant species are distributed on the property.

Urban/Residential Areas

Since the GWSS has been present in Southern California for at least a decade, it is possible that it has already been introduced into residential areas within the survey area. Regions most at risk would be new (10 years old or less) housing and commercial developments.

Recommendation: After removal from the field, all insect detection traps within the survey area should be routinely screened for GWSS. This includes all traps deployed for detection of exotic pests in urban areas including the sticky inserts from Jackson traps, Pherocon AM traps, ChamP traps and Japanese beetle traps.

Recommendation: AM traps should be “piggybacked” on the Mediterranean fruit fly (Medfly) trap sites in the geographic area identified above. Traps should be placed at the same per-square-mile density as the Medfly traps, up to a density of 5 AM traps per square mile. Multiple host sites with citrus and other seasonal pome and stone fruits would be targeted. Traps would be placed in citrus, whenever possible, left on-site for six weeks, and follow the Medfly Jackson traps throughout the trapping season.

Recommendation: Visual surveys for all life stages should be conducted in all larger ornamental plantings containing GWSS hosts. Areas to be examined would include landscaped median strips, border plantings along major urban thoroughfares, rights-of-way along major state highways and interstates, and in parks, industrial parks, golf courses, and cemeteries.

Cropland

- If the GWSS is going to invade croplands, the most probable routes will be: (1) via spread from nearby infested urban areas; or (2) by the use of egg infested stock to establish new citrus plantings. Also since citrus groves are capable of generating large numbers of individuals, and sustaining sharpshooter populations throughout the year,

such plantings should be targeted for detection of GWSS throughout the major agricultural production areas of the state.

Recommendation: Commercial crop survey shall be prioritized as follows: (1) all commercial plantings of *Citrus* spp., *Vitis* and *Prunus* spp. which fall entirely or partially within a ½ mile radius of residential areas or other known GWSS reservoirs (i.e., riparian habitats and/or oak woodlands; (2) all new citrus plantings; and (3) all the remaining citrus groves in each county.

Survey Guidelines—Priorities 1 and 2: Visual searches for all life stages shall be conducted throughout each block where the borders of the block are within the above radius. Yellow panel traps may be used to augment visual searches. If traps are utilized, they should be deployed at a minimum density of one per 120 acres. Trap from April through October, relocating the trap into a new 20-acre subquadrant every six weeks. Service every two to three weeks. Use a new trap at the time of each relocation; replace traps as needed. Traps deployed in *Citrus* and *Prunus* should be placed in the upper canopy near flush foliage in exposed positions (not inside the foliage). Smaller rapidly growing trees inter-planted within groves of mature trees have also been observed with high numbers of adult GWSS and may represent the best sites for visual inspections or trap deployment. Observations in the southeastern U. S. also indicate that peach trees in a weakened condition or even single limbs dying from severe scale infestations or those prematurely defoliated due to other natural causes are particularly attractive and often act as a congregation site for large numbers of adults. Deployment of traps in or near stressed trees may enhance the probability of detection. In vineyards, poles/stakes should be used to suspend yellow panel traps just above the grape canopy. Deployment in perimeter rows or along heavily traveled routes within the planting should be avoided.

Priority 3: Deploy traps at a minimum density of one per 240 acres using the above guidelines for citrus. Trap from April through October, relocating the trap into a new 40-acre subquadrant every six weeks. Service every two to three weeks. Use a new trap at the time of each relocation; replace traps as needed.

- Other tree crops should be surveyed using “in-place” traps in the same manner as those used for detection of exotic pests in rural settings.

Recommendation: All traps used by county, university extension and research personnel, private contractors and consultants (Pest Control Advisors), and growers for monitoring, controlling or certification of freedom from, orchard, vineyard, and ornamental crop pests should be screened for adult sharpshooters. Traps which should be inspected include, but are not restricted to, those used for apple maggot, walnut husk fly, olive fruit fly, Mediterranean fruit fly, Oriental fruit moth, peach twig borer, and codling moth. Physical devices such as “hopper tape” used to control grape and variegated leafhoppers should also be examined especially when deployed in vineyards bordering potential reservoir habitats such as citrus groves, housing developments, etc.

Hitchhiking Adults

It has been suggested that adult GWSS may be transported to winery locations by hitchhiking on gondolas of harvested grapes.

Recommendation: Survey high-risk locations and their immediate environs. High risk wineries are those which: (1) receive either large volumes of grapes from a variety of locations within a single county or from several counties; (2) receive grapes from within or near locations known to be infested by GWSS; and (3) allow unprocessed loads of grapes harvested at night to be present at the crushing location until midday of the following day. During grape harvest, such locations should be continuously trapped and visually inspected at least once.

Specimen Collection and Identification

All glassy-winged sharpshooter suspects shall be submitted to the Plant Pest Diagnostics Center in Sacramento or submitted to the local county agricultural commissioner for submission to the Center for confirmation. This is particularly important for specimens which represent new distributional and host records and those which will be used as the basis for regulatory actions.

Specimen Collection and Submission of Samples – Leaves with suspect **egg masses** and/or egg scars should be placed in sealed plastic bags. Free-living **adults and nymphs** should be killed by placing them in vials containing 70% alcohol. These containers should have tight fitting corks or screw top lids to prevent/minimize the loss of specimens or preservative during transit to the laboratory. Suspect adults on sticky traps can be submitted by either sending the entire trap or by cutting out and sending the portion of the trap containing the suspect sharpshooter. Prior to shipment yellow panel traps should be reversed so that the sticky surfaces are on the inside and a rubber band placed around the outside to hold the two halves in position. Care should be taken to insure that the sticky surfaces are not in contact. Do not submit traps covered with clear plastic. Sticky traps should be placed in sealed plastic bag(s) before packaging. “Cut-outs” should be placed in dry plastic vials and sized to fit tightly inside so that neither the specimen nor the “stickem” comes in contact with the inner surface of the container. Use a Standard Form 65-020, “Pest and Damage Record” (PDR), when sending specimens for identification.

SECTION II

INITIAL COUNTY GLASSY-WINGED SHARPSHOOTER SURVEY¹

An initial county survey is the minimum survey determined to be necessary to evidence that a county is apparently free from glassy-winged sharpshooter (GWSS). This survey must be completed prior to a county request to the Department for approval of adoption of a county ordinance for protection against the glassy-winged sharpshooter, as provided in Section 5305, Food and Agricultural Code.

In addition to the initial county survey, each county adopting an ordinance against GWSS must also complete all remaining statewide survey recommendations. This may be done concurrently.

This survey program shall include visual and trapping surveys of nurseries, urban or residential areas, and croplands in each county requesting ordinance approval.

- Nurseries

All nurseries in the county, which receive nursery stock from outside the county, should be contacted and the sources of imported plant materials determined. Those nurseries receiving or which have received (within the past five years) host plants from the known infested counties should be considered high-risk establishments and surveyed using the recommended survey methods* (sweep survey; visual surveys of ovipositional hosts for nymphs, egg masses and egg scars; trapping at the rate of two yellow panel traps per acre for a minimum of four weeks).

Approximately 10% of the other nurseries in the county should be randomly surveyed using the same methods.

- Urban or Residential Areas

Yellow panel traps deployed at a density of up to five per square mile; traps placed in citrus or other favored ornamental hosts; with negative catches for four to six weeks.

All exotic insect detection traps deployed in the county should be checked for one month with no adult GWSS found.

Visual surveys completed on 10% of public and commercial ornamental plantings determined to represent the greatest risk. These would include those that transect through, or are a part of, housing tracts, shopping malls and industrial parks landscaped within the last five years.

¹ Recent changes are indicated with double underlining.

- Croplands

Complete initial visual searches of 25% of all blocks of commercial citrus and 10% of all grape vineyards and *Prunus* spp. orchards, the borders of which fall within a ¼ mile radius of urban or commercial sites landscaped within the past five years.

Complete initial visual searches of at least 25% of all new (five years old or less) citrus plantings.

Trap the remaining citrus acreage at a minimum density of one yellow panel trap per 240 acres of host trees for a minimum of four to six weeks; inspect each trap at least every three weeks.

*** Recommended Survey Methods**

Visual Searches - Visual searches can be conducted to find adults, nymphs, nymphal cast skins, egg masses, and egg scars. When searching for active life stages on individual plants, certain behavioral characteristics of the sharpshooter can be used to increase the probability of detection. Important traits to be considered are: 1) adults and older nymphs are primarily stem feeders; 2) new flush growth is preferred; and 3) on trees, the insects usually select shoots that are growing upward (vertically oriented as opposed to horizontal twigs).

Host searches should be enhanced by using nets (aerial and sweep) and beating sheets. The effectiveness of these collection devices is largely dependent on the types and density of life stages present. When populations are large and well established, adults are often the easiest life stage to detect because they are highly visible when flying around or between their host plants. Flight activity is most pronounced during the late morning and afternoon hours, therefore, surveys should be conducted during the warmer parts of the day, if practical. Correct timing is particularly critical if adult numbers are low. At low densities and during cooler times of the day, nets may be used to agitate foliage causing cryptic adults to take flight. Either aerial or sweep nets can be used to capture adults, but the former are often more effective since they are lighter, more maneuverable, have larger openings, and are often equipped with longer handles. Retrieval of specimens from aerial nets is also more efficient as captured individuals are always visible. Sweep nets are constructed of sturdy durable materials and designed to quickly sample a wide variety of short (generally four feet or less in height), woody, and herbaceous plants, such as those found in nurseries. However, care must be exercised when using these nets so that certain tender plants are not injured. Beating sheets are also an excellent tool because they: 1) are more effective (as compared to a sweep net) in directed sampling of highly suspect plant parts, such as erect flush growth; and 2) permit the rapid discovery of nymphs and their cast skins. They also help facilitate the capture of nymphs because unlike adults, which often fly before or immediately after landing, the immatures often will remain on the sheet long enough to allow collection. Beating sheets are most effective early in the day when temperatures are low and the insects are less active.

Traps - Yellow sticky panels measuring a minimum of 5" X 9" are the trap of choice for GWSS. Of the commercially available ones, unbaited Pherocon AM traps are the best suited for survey, as they are relatively inexpensive, have a moderately large sticky surface, and can be easily deployed in a wide variety of hosts, either by hand or with the use of a trapping pole. GWSS has also occasionally been recovered from the sticky inserts in Jackson traps, indicating that other trap types containing sticky components may yield specimens.

SECTION III

NURSERY SURVEY FOR GLASSY-WINGED SHARPSHOOTER (GWSS) INFESTED COUNTIES

The following guidelines are intended for use in either a voluntary nursery program or a program necessitated by county ordinances or other restrictions for the shipment of GWSS-free nursery stock to locations outside the known infested areas of California.

- The “Monitoring for GWSS in Commercial Nurseries” Guidelines prepared by R. A. Redak, J. A. Bethke, T. D. Paine, J. N. Kabashima, and M. Blua, Department of Entomology, University of California (**Appendix B**), shall be followed by any nursery planning to ship nursery stock to counties outside the known GWSS infested area.
- The production nursery shall enter into a compliance agreement with the origin county agricultural commissioner which sets forth the monitoring and/or treatment requirements, establishes the types of nursery stock to which the agreement applies, and to authorize the nursery to use a method of evidencing compliance with said agreement which is acceptable to the destination counties.
- County agricultural commissioners shall monitor compliance with the agreement on a regular basis, with a minimum of one bimonthly inspection.
- Nurseries maintaining or shipping nursery stock of the kinds covered by the agreement which is determined to be infested with GWSS are in violation of their compliance agreement and shall immediately discontinue shipments under the agreement. Appropriate corrective action shall be taken by the origin county agricultural commissioner.

GLASSY-WINGED SHARPSHOOTER**OVIPOSITION(*) AND FOOD HOSTS****Woody Plants:**

Almond	<i>Prunus amygdalus</i>
Apple	<i>Malus sylvestris</i>
Apricot	<i>Prunus armeniaca</i>
Arborvitae	<i>Thuja</i> spp.
Ash*	<i>Fraxinus</i> spp.
Avocado*	<i>Persea</i> spp.
Birch	<i>Betula</i> spp.
Blackberry	<i>Rubus</i> spp.
Blackgum	<i>Nyssa sylvatica</i>
Bottlebrush*	<i>Melaleuca</i> spp.
Bougainvillea	<i>Bougainvillea</i> spp.
Boxwood	<i>Buxus</i> spp.
Camellia	<i>Camellia japonica</i>
Camphor tree*	<i>Cinnamomum camphora</i>
Carob*	<i>Ceratonia</i> spp.
Carrot wood*	<i>Cupaniopsis anacardioides</i>
Catalpa	<i>Catalpa bignonioides</i>
Cherry	<i>Prunus avium</i>
Cherry laurel	<i>Prunus caroliniana</i>
Chinese Elm	<i>Ulmus parvifolia</i>
Chinaberry	<i>Melia azedarach</i>
Citrus*	<i>Citrus</i> spp. (Note: GWSS is known to oviposit on lemon peel)
Coral tree*	<i>Erythrina caffra</i>
Cotoneaster	<i>Cotoneaster</i> spp.
Crape myrtle*	<i>Lagerstroemia</i> spp.
Elaeagnus	<i>Elaeagnus</i> spp.
Elderberry*	<i>Sambucus</i> spp.
Escallonia*	<i>Escallonia</i> spp.
Eucalyptus*	<i>Eucalyptus</i> spp.
Euonymus*	<i>Euonymus</i> spp.
Fig	<i>Ficus</i> spp.
Grape*	<i>Vitis</i> spp.
Hardenbergia*	<i>Hardenbergia</i> spp.

Heavenly bamboo*	<i>Nandina domestica</i>
Holly	<i>Ilex</i> spp.
Japanese jasmine	<i>Jasminum mesnyi</i>
Laurel sumac*	<i>Rhus</i> spp.
Loquat*	<i>Eriobotrya japonica</i>
Macadamia*	<i>Macadamia</i> spp.
Magnolia*	<i>Magnolia</i> spp.
Maidenhair-tree	<i>Ginkgo biloba</i>
Mulberry*	<i>Morus</i> spp.
Myoporum*	<i>Myoporum</i> spp.
Oak*	<i>Quercus</i> spp.
Oleander	<i>Nerium</i> spp.
Orchid tree*	<i>Bauhinia purpurea</i>
Peach	<i>Prunus persica</i>
Pear	<i>Pyrus communis</i>
Philodendron	<i>Philodendron</i> spp.
Photinia*	<i>Photinia</i> spp.
Pine	<i>Pinus</i> spp.
Pittosporum	<i>Pittosporum</i> spp.
Plum, chicksaw	<i>Prunus angustifolia</i>
Plum, cultivated	<i>Prunus</i> spp.
Podocarpus*	<i>Podocarpus</i> spp.
Privet*	<i>Ligustrum</i> spp.
Pyracantha/Firethorn	<i>Pyracantha coccinea</i>
Redbud*	<i>Cercis</i> spp.
Sassafras	<i>Sassafras albidum</i>
Silk tree	<i>Albizia julibrissin</i>
Strawberry tree*	<i>Arbutus unedo</i>
Sumac*	<i>Rhus</i> spp.
Sweetgum	<i>Liquidambar styraciflua</i>
Sycamore*	<i>Platanus</i> spp.
Tristania*	<i>Tristania laurina</i>
Trumpet creeper	<i>Campsis radicans</i>
Trumpet flower*	<i>Gelsemium sempervirens</i>
Tung	<i>Aleurites fordii</i>
Tupidanthus*	<i>Tupidanthus calyptratus</i>
Umbrella tree*	<i>Schefflera</i> spp.
Walnut	<i>Juglans</i> spp.
Willow, Corkscrew	<i>Salix matsudana</i> 'Tortuosa'
Wisteria	<i>Wisteria</i> spp.

Viburnum*

Yaupon

Yucca

Viburnum* spp.Ilex vomitoria**Yucca aloifolia***Herbaceous Plants:**

Asparagus

Boneset

Cocklebur

Coffeeweed*

Corn

Cotton

Cowpea

Dogfennel

Evening-primrose

Gladiolus

Goldenglow

Goldenrod

Hibiscus***Hollyhock***

Horseweed

Johnsongrass***Lambsquarter***

Lettuce, wild

Mallow

Milkweed

Okra*

Philodendron

Pigweed

Pokeweed

Ragweed

Sowthistle

Sunflower***Tree Tobacco***

Wild bergamot

*Asparagus officinalis**Eupatorium perfoliatum**Xanthium* spp.***Cassia occidentalis*, *C. tora****Zea mays**Gossypium* spp.*Vigna sinensis**Eupatorium capillifolium**Oenothera laciniata**Gladiolus* spp.*Rudbeckia laciniata**Solidago* spp.***Hibiscus* spp.*****Althaea* spp.***Erigeron canadensis****Sorghum halepensis******Chenopodium* spp.***Lactuca canadensis**Malva* spp.*Asclepias* spp.***Hibiscus* spp.***Philodendron* spp.*Amaranthus hybridus*, *A. spinosus**Phytolacca americana**Ambrosia* spp.*Sonchus oleraceus****Helianthus* spp.*****Nicotiana* spp.***Monarda fistulosa*

California Department of Food and Agriculture
Plant Health and Pest Prevention Services
Permits and Regulations
March 5, 2000

Monitoring for GWSS in Commercial Nurseries

Guidelines prepared by

R. A. Redak, J. A. Bethke, T. D. Paine, J. N. Kabashima, and M. Blua.
Department of Entomology
University of California,
Riverside, CA 92521

March 24, 2000

1. **Be familiar with the basic identification of Glassywinged Sharpshooters.** You must be able to recognize egg masses, nymphs, and adults. Identification references can be obtained from the
 - a. Online Media Kit from the University of California, Division of Natural Resources internet site (<http://danrcs.ucdavis.edu/Special/gwss/default.shtml>), also available from, UC County Extension Offices, County Agriculture Commissioner's Offices, and California Association of Nurserymen
 - b. California Department of Food and Agriculture internet site (<http://www.cdffa.ca.gov/gwss>)
 - c. California Department of Food and Agriculture publication, California Plant Pest & Disease Report Volume 18, Nos.3-4, June-September, 1999
 - d. your local University of California, Cooperative Extension Farm Advisor.
2. **Know where you are.** If you are in a urban environment in Southern California or adjacent to citrus groves (in San Diego, Imperial, Riverside, Orange, Los Angeles, San Bernardino, Ventura, Santa Barbara, and Kern Counties, as of Jan. 20, 2000), you should assume your inventory has a high probability of carrying glassywinged sharpshooters and active monitoring and control procedures are warranted. This is especially true if your property is near or adjacent to housing developments, parks, agricultural, or natural areas planted with shrubs and trees. Glassywinged sharpshooters are strong flyers; they can easily disperse into nurseries from nearby trees and shrubs.
3. **Detection of Glassywinged Sharpshooters.** Currently, there are no satisfactory sharpshooter monitoring methods that are effective AND are easily adaptable for grower use. The following series of detection methods are suggested to monitor glassywinged sharpshooters in commercial nurseries.
 - a. **Standard yellow sticky card insect monitoring traps.** Standard yellow sticky cards should be placed at approximately canopy height at a density of not-less than 1 card per one-half acre. If multiple plant canopies are present,

then multiple cards should be used to detect insects from each of the canopies present. Cards should be checked for sharpshooters no less than once per week. Sticky cards will only detect adult sharpshooters at relatively high population densities. Lack of detection on sticky cards DOES NOT necessarily mean that sharpshooters are not present, but trapped adults are solid evidence of a problem. Sticky card will not detect sharpshooters in the juvenile or egg stages nor are they likely to detect adult sharpshooters at low densities.

- b. **Beat sheets, beat trays, or sweep nets:** When the ambient temperature is cool (below approximately 60°F), beat or sweep sampling may be an effective way to detect adult and juvenile sharpshooters. **For beat sampling,** place a white, two foot by two foot sheet of fabric, wood , stiff paper or other suitable material underneath the vegetation canopy to be sampled. Strike or shake vigorously the foliage overhanging the white sheet (be careful not to damage the foliage). Glassywinged sharpshooters will fall from the foliage and can be easily seen on the white sheet. Beat sampling will not detect sharpshooters in the egg stage, nor will it be effective at warmer temperatures. At warmer temperatures, the insects will either jump or fly away (and not fall onto the detection sheet) when disturbed. **For sweep sampling:** Simply sweep insect nets through foliage and examine bag contents. Detection of sharpshooters by sweep sampling may also be performed successfully during warmer (greater than 60°F) periods of time.
- c. **Visual Inspections:** Visual inspections of foliage is perhaps the best method for detecting all stages of the sharpshooter. Carefully examine leaf petioles, twigs and small branches for the presence of nymph and adult sharpshooters. Be aware that the insects will try and hide from observation by moving to the far side of any available stem. Once scouts learn to recognize the characteristics, egg masses can easily be detected by visually inspecting the underside of leaves. Leaves should be backlit against a sunny sky to properly detect egg masses. All materials scheduled for transport out of Southern California should be closely examined.

- 4. **Disinfestation of Glassywinged Sharpshooter.** Upon detection, reasonable efforts should be made to eradicate all stages of the glassywinged sharpshooter on plant material scheduled to be shipped to areas north of Santa Barbara, Ventura, Los Angeles, Kern, and San Bernardino Counties. Three strategies should be considered for treating plant material infested with sharpshooters:

- a. treating for active adult and juvenile infestations,
- b. treating for juvenile infestations arising from egg hatch at point of destination,
- c. treating for viable egg masses prior to shipment.

Treating for Active Adult and Juvenile Infestations:

As adults and juveniles may infest nursery material at any time, right up to the period of shipment, treatments for these stages of the insect should be performed as near to the time of shipping as is reasonably possible. **Any registered insecticide suitable for leafhopper control may be used. For any compound used, follow all label directions carefully.**

Treatments involving non-systemic materials should be thoroughly applied with a reasonable expectation that contact with the insect is made. Such treatments should be performed immediately prior to shipment. Following treatment, plants should be loaded (as rapidly as re-entry requirements allow) and shipped to prevent post-treatment infestation.

Treatments involving systemic insecticides must allow sufficient time for the distribution of the insecticide throughout the plant. Note, that several days to weeks (depending on compound) after treatment applications may be required to allow materials to distribute throughout the plant and achieve effective control.

Treatments for Juvenile Infestations Arising from Egg Hatch at the Point of Destination

If sharpshooter eggs masses are detected, plants should be treated with a systemic or long-acting insecticide so that newly hatched and feeding juvenile sharpshooters are killed. Again, from several days to weeks after the application has been made may be required for effective control. **For any compound utilized, follow all label directions carefully.**

Treatments for Viable Egg Masses prior to shipping

Currently, there are no registered insecticides that have been demonstrated to kill the egg masses of glassywinged sharpshooters. Studies are currently underway at the University of California to determine the efficacy of various insecticides against sharpshooter egg masses. As such information is developed, it will be released. Direct treatments of egg masses will reduce the need for systemic applications of materials to control juveniles emerging from egg masses at the destination point of the shipment.

Warning on the Use of Chemicals

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations printed on the container label. Confine chemicals to the property being treated. Never use chemicals in a manner that will result in runoff into storm or sewer drains, which will contaminate water supplies or natural waterways.

Dispose of empty containers carefully. Follow label instructions for disposal and never reuse containers. Make sure children and animals cannot reach empty containers. Do not pour unused or excess chemicals down the sink or toilet.

Consult your county agricultural commissioner for correct ways to dispose of excess pesticides. Never burn pesticide containers.

No endorsement of named or illustrated products is intended, nor is criticism implied of similar products that are not mentioned or illustrated.

Distribution of Glassy-winged Sharpshooter in California



**California Department of
Food & Agriculture**
March 21, 2000